NOZZLE DEFLECTOR ELEMENT

Cross Reference to Related Applications

[001] This application is a continuation-in-part application of United States Patent Application No. 10/210,491 filed August 01, 2002, which is incorporated herein by reference in its entirety.

Field and Background of the Invention

[002] This invention relates to sprinkler heads and nozzles. Particularly, the invention relates to such sprinkler heads and nozzles used in outdoor irrigation systems, such as the watering of lawns and plants in residential, commercial and industrial settings.

[003] As a general rule, a sprinkler device has a sprinkler head. The sprinkler head has an attached or an integrated nozzle. The water flows through the head, to the nozzle, and from the nozzle to the area to be irrigated.

[004] Conventional sprinklers or irrigation systems typically comprise a series of pipes, connected to each other end-to-end, the pipes being connected to a water source, such as an outdoor faucet. The pipes are constructed so as to, for example, extend about the perimeter of an area requiring watering or irrigation, or may be

laid in some other fashion so that effective watering can occur. At periodic points along the length of the pipes, water outlets are constructed, whereby water is diverted from the pipe, passes along the outlet, and typically exits through a sprinkler head or nozzle which distributes the water in a particular coverage pattern so as to provide water to plants and lawn in that area. The spacing of the sprinkler heads or nozzles along the pipe is determined based not only upon the type of plant requiring watering, but also upon the spread and/or range of a particular nozzle, namely, the specific area to which the water is delivered.

[005] In certain situations, the sprinkler head or nozzle may be such that the water is delivered as a drip or in a steady low volume stream, but, in many situations, the sprinkler head or nozzle is not intended to deliver water to a particular point or very small area, but to provide watering over a much larger area.

[006] While a variety of styles and shapes of lawn and garden sprinkler heads exist, nearly all of these are designed and tooled so as to disperse water which is generally in a direction upward and away from the head. A common problem with such sprinkler heads or nozzles is that water is not distributed evenly and consistently over the entire area which that nozzle is intended to cover. As a result, the area on the ground nearer the head may receive little, or even no, water, while areas further from the head will tend to

receive almost all of the water. This situation often means that plants and lawn in the vicinity or adjacent the sprinkler heads must be separately irrigated, either by hand, or by an adjacent sprinkler head. The result is that it often becomes necessary to place the sprinkler heads and nozzles at closer intervals with respect to each other to ensure dispersal patterns to cover unwatered areas very near a particular or adjacent head. This, in turn, may result in significant overlap of areas to be watered, in order to achieve the objective of providing water to those areas which are missed by adjacent sprinklers heads or nozzles.

[007] Unfortunately, the placement of the sprinkler heads and nozzles, even in overlapping fashion, does not always address the problem of uneven coverage. Moreover, this type of placement is often not feasible, and generally uneconomical, since, in order to water all areas, certain areas must receive more water. Therefore, while placement of sprinkler heads to cause overlapping watering may address the problem of providing water to all areas, this still does not address the issue of consistent and even watering of all areas within a sprinkler nozzle's intended coverage.

Summary of the Invention

[008] In one aspect, the present invention therefore provides for an irrigation or sprinkler head nozzle or head which contains or includes a deflector in the path of the water dispensed, the

deflector being configured and dimensioned so as to intercept a portion of the water exiting the sprinkler head or nozzle in such a way that the coverage area is increased and/or optimized.

[009] In another aspect, the invention relates to water deflection devices themselves, the deflection devices being shaped and configured so as to be received within an existing or adapted sprinkler head or nozzle to thereby intercept a portion of a water stream being dispensed from that nozzle and to provide a more consistent and even coverage for watering the area around that sprinkler head or nozzle.

[010] Preferably, the deflector device, or deflector within a sprinkler head, may take many different forms and shapes, and these will vary according to the nature of the area being watered by the sprinkler head, the design of the head or nozzle, and the typical deficiency with respect to such sprinkler head in reaching all areas evenly.

[011] According to one aspect of the invention, there is provided a water deflector for use with an irrigation nozzle having a water channel including a water inlet and a mouth from which water is dispersed, the water deflector comprising: a shaft for passing through the water channel of the irrigation nozzle, the shaft having a lower end and an outer end, and an aperture part way

along its length between the lower and outer ends; and a base member connected to the shaft at the lower end thereof, the base member having a width sufficiently large to prevent, in use, the base member from entering the water inlet of the water channel; wherein a portion of the water passing through the water channel is deflected by the water deflector to alter the pattern of watering about the irrigation nozzle.

[012] Preferably, the shaft is in the form of an elongate plate, which may be flat or curved, and the base member comprises a substantially linear plate member. The water deflector may further comprise a flange mounted on the shaft above the base member, the flange in use positioning the shaft optimally within the water channel. The shaft is configured with respect to its length and shape so as to provide optimal water distribution for the pattern of watering about the irrigation nozzle.

[013] Preferably, the aperture comprises an elongate slot formed in the shaft near the upper end thereof, such that the slot is formed at a position wherein it will be located at or near the mouth of the irrigation nozzle. The shaft may be bent at its end opposite that of the base member in an arcuate form.

[014] According to another aspect of the invention, there is provided an irrigation nozzle comprising a water channel having an

inlet end for receiving water from a source and an outlet end from which the water is discharged in a pattern to an area adjacent the irrigation nozzle; and a water deflector plate near or at the outlet end, the water deflector plate comprising a substantially flat shaft and means for securing the shaft to the irrigation nozzle.

[015] The shaft may comprise a first end attached near the outlet end of the water channel, and a second end remote from the outlet end. Alternatively, the shaft may further comprise a base member, the base member being located outside the water channel at the inlet end thereof and connected to an end of the shaft, the shaft further comprising a flange within the water channel for optimal positioning of the shaft within the water channel.

[016] Preferably, the shaft comprises an aperture, preferably a elongate slot, to permit flow of water therethrough.

[017] According to yet another aspect of the invention, there is provided a nozzle comprising a water channel having an axis, the water channel having an inlet end for receiving water from a source and an outlet end from which the water is discharged to an area adjacent the nozzle; and a water deflector comprising a plurality of apertures at or near the outlet end of the water channel, each aperture being dimensioned and oriented in the nozzle to discharge

water therefrom at a different angle relative to the nozzle.

Brief Description of the Drawings

[018] Figure 1 is a schematic view of a conventional nozzle and the area it waters;

[019] Figure 2 is a schematic view of a nozzle incorporating a deflector of the invention, and the area it is intended to water;

[020] Figure 3 is a nozzle including one particular deflector of the invention, and showing the area that it waters;

[021] Figure 4 is a schematic side view of a conventional sprinkler nozzle;

[022] Figure 5 is a top view of the sprinkler nozzle shown in Figure 4;

[023] Figure 6 is a bottom view of the sprinkler nozzle shown in Figure 4;

[024] Figure 7 is a bottom view of the sprinkler nozzle shown in Figure 4, and including a water deflector of the invention;

[025] Figure 8 is a side view of the sprinkler nozzle shown in Figure 7;

[026] Figure 9 is a front view of a water deflector for use with a sprinkler nozzle, in accordance with the invention;

[027] Figure 10 is a side view of the water deflector shown in Figure 9;

[028] Figure 11 is a side view of the water deflector shown in Figure 9, but having been bent to deflect water;

[029] Figure 12 is a top view of the deflector shown in Figure 9;

[030] Figure 13 is a top view of another embodiment of a deflector;

[031] Figure 14 comprises a plurality of water deflectors, mounted on a base;

[032] Figure 15 is a schematic side view of a water deflector of the invention, comprised of plastic, part of which oscillates in response to water pressure;

[033] Figure 16 is a perspective schematic view of one form of the water deflector of the invention;

[034] Figure 17(a) is a schematic front view of another embodiment in accordance with the invention;

[035] Figure 17(b) is a diagrammatic representation of an integrated sprinkler head and nozzle assembly designed to receive deflector as illustrated in Figure 17(a) and Figure 17(c) shows the assembly in Figure 17(b) fitted with such a deflector;

[036] Figure 18(a) shows a multiple-shaft water deflector, and

[037] Figure 18(b) is a schematic representation of water dispersal therefrom;

[038] Figure 19 shows a forked end water deflector;

[039] Figure 20 shows a flared end water deflector;

[040] Figure 21 shows a split-end water deflector in accordance with the invention;

[041] Figure 22(a) shows a schematic top view of deflector

connected to the outside of a nozzle;

[042] Figure 22(b) is a side of the deflector shown in Figure 17(a);

[043] Figure 23 shows a nozzle fitted with a deflector as shown in Figure 22(a) of the drawings;

[044] Figure 24 is a top view of the nozzle shown in Figure 23 of the drawings;

[045] Figure 25 shows a nozzle/deflector assembly with the deflector attached to the nozzle;

[046] Figure 26 is a schematic cross-section of a nozzle incorporating the deflector of the invention;

[047] Figure 27 is a front view of the nozzle shown in Figure 26 of the drawings;

[048] Figure 28 is a perspective view of a further embodiment of the nozzle deflector of the invention; and

[049] Figures 29(a) and 29(b) are front and side perspective views respectively of a further embodiment of the invention.

Detailed Description of the Invention

[050] In the attached drawings, generally diagrammatic illustrations are provided regarding different forms of the sprinkler head and nozzle, as well as the patterns of watering effected by the particular nozzles.

[051] As a general introduction, the invention can be described

as a water deflector, either standing alone, or for use with a sprinkler nozzle used in irrigation systems, the water deflector being positioned about the outlet of the sprinkler nozzle in such a manner so as to, at least partially, interrupt the flow stream of the water discharged from the sprinkler head or nozzle in a manner which would enhance the area to which water is provided by the sprinkler head and nozzle. Generally, enhancement of the area watered means that, with the water deflector, watering occurs over that area in a more consistent and even manner, substantially preventing dry or unwatered areas on the one hand, and over-watering of remaining areas on the other.

[052] It should also be understood that the invention relates to water deflectors, either standing alone, or attached to nozzles which may commonly be used with fire hoses, garden hoses and the like for the purposes of achieving an enhanced watering of a particular area to facilitate evenness and consistency of watering over that area.

[053] Conventional sprinkler heads or nozzles are placed within an irrigation system with the intention that an area adjacent the sprinkler head receive water. The shape of this area may vary depending upon the construction of the sprinkler nozzle. Thus, depending upon the configuration of the water outlet in the sprinkler nozzle, the area watered may be in the shape of a

quadrant, a half-circle, a full circle, or, indeed, any particular portion of a circle. Additionally, the sprinkler nozzle may be configured so as to water a particular strip, which may be a rectangular shaped area, with the sprinkler nozzle generally in the middle thereof. As mentioned, the water discharged from the sprinkler nozzle is generally ejected upwardly and outwardly. The purpose of such a mechanism would be, of course, to enable the water to reach the distant perimeter of the half-circle, full circle or the like. However, a common deficiency encountered with respect to such sprinkler nozzles is that, since the water is being discharged upwardly and outwardly, the outer reaches of the area intended to be covered will receive water, but those areas and spaces nearer the sprinkler nozzle will receive no or little water.

[054] The water deflector for use with a sprinkler nozzle, or formed as part of a sprinkler nozzle, of the present invention is intended to address this common deficiency encountered in sprinkler nozzles so as to provide more even and consistent watering over the entire area. This will allow for proper distancing of sprinkler heads in an irrigation system with respect to each other so as to be more economical, more effective at watering, and require less overlap to take into account the deficiencies in terms of reach and watering consistency.

[055] More particularly, the invention provides a water

deflector which enables areas nearer the sprinkler head to be watered, such areas often being missed due to the upward and outward discharge of the water stream from the sprinkler nozzle.

[056] Reference is now, made to the accompanying drawings. In Figure 1, there is diagrammatically shown a conventional nozzle 12, and area of watering 14, the area of watering 14 being represented in this figure having a quadrant shape. Since this figure is merely illustrative, it should be appreciated that the invention is not in any way limited to watering a quadrant area or, indeed, any specific shaped area at all.

[057] The area of watering 14 comprises an inner portion 16 and an outer portion 18. Due to the upward and outward nature of the discharge of water from the nozzle 12, the area represented by the outer portion 18 tends to obtain all or most of the water being discharged from the nozzle 12. As a result, the inner portion 16, representing the area nearer the nozzle 12, receives less water, and this portion, or certain parts of it, may indeed receive no water at all.

[058] Figure 2 of the drawings shows a diagrammatic representation of area watered when a nozzle 20, equipped with a water deflector in accordance with the invention (not shown in Figure 2, but illustrated in subsequent Figures) is used. The

nozzle 20, with appropriately deflected water emerging therefrom, waters not only the outer portion 22, but also ensures that the inner portion 24 receives water as well. Preferably, the watering over the outer and inner portions 22 and 24 respectively would be substantially consistent in terms of volume received over a particular period of time.

[059] As will be described below, one of the important features of the water deflector of the invention is a hole, slot or aperture or the like therein. It has been indicated from appropriate testing that the absence of this hole, slot or aperture can cause a different pattern of watering, and this is shown in Figure 3 of the drawings. Thus, the nozzle 26 shown in Figure 3 incorporates a water deflector (not shown) without the aperture or slot, and the watering pattern achieved is such that some water is received in the area nearer the nozzle, identified as near portion 28, while outer corner portions 30 and 32 also receive water. However, a central portion 36 tends not to receive water, or significant quantities of water. In order to achieve more even distribution, the water deflector should preferably incorporate the hole or aperture, as will be described below, to effect the consistency of watering which can be achieved in accordance with the invention.

[060] Figures 4, 5 and 6 show a side view, top view and bottom view respectively, in diagrammatic form, of a nozzle 40 for use in

an irrigation system, the nozzle being one able to receive a water deflector designed in accordance with the invention. The nozzle 40 comprises a top section 42, a mid-section 44, and a bottom section 46. As will be seen in Figure 4, the bottom section has an outer screw thread, which allows the nozzle 40 to be attached to, in a conventional manner, a head and appropriate piping in an irrigation system. Water comes up through such pipe, not shown, in the direction indicated by arrow 48.

[061] A water channel 50, preferably having an axis substantially parallel to that of the nozzle 40, extends through the bottom section 46, mid-section 44 and into top section 42. The top section 42 has a cut-out or mouth, defined by a generally vertical wall 54, and an angled wall 56. Water to be discharged from the nozzle 40 passes through the channel 50, and from the channel 50 into the mouth 52. The force with which the water is discharged from the channel 50, coupled with the configuration of the vertical and angled walls 54 and 56 respectively, cause the water to be dispensed up and out over an area, which can generally be illustrated as one following the pattern shown in Figure 1 of the drawings.

[062] With reference to Figure 5, the top section 42 has a screw 58 to regulate the volume of water flowing through the nozzle. Figure 6 shows the bottom section 46, the mid-section 44

and the inlet 60 to the water channel 50. Figure 6 also shows a volume adjustment plate 62 which allows for adjustment of water flowing through the nozzle 40, as well as the pressure thereof entering the inlet 60 and passing through the water channel 50. Such adjustment mechanisms are fairly conventional, and will not be further described herein.

[063] Figure 7 shows the nozzle 40, as shown in Figure 4 of the drawings, but with a water deflector 70 of the invention inserted in the water channel 50. A side view of the arrangement in Figure 7 can be seen in Figure 8 of the drawings, also showing the nozzle 40 and the water deflector 70 located within the channel 50. The shape and configuration of the water deflector 70 is illustrated in Figures 9 to 11 of the drawings, as will now be described.

[064] Figure 9 illustrates the front view of a water deflector 70 comprising a base 72 and upwardly extending shaft 74. Both the base 72 and shaft 74 are comprised of a thin metal or plastic strip. An elongated slot or aperture 76 is formed within the upper portion of the shaft 74. Near the base of the shaft 74 is a pair of flanges 78 and 80 which, as will be described briefly below, facilitate the proper positioning of the shaft 74 within the water channel 50.

[065] The base 72 generally has a width which exceeds the

diameter of the channel 50 so that when the water deflector 70 is inserted within the channel 50, as will be described below, it will remain in place, and the pressure of the water will not cause the water deflector 70 to be forced out of the water channel 50.

[066] Figure 10 shows a side view of the water deflector 60 illustrated in Figure 9, where the same reference numerals have been used to describe the various components. With respect to Figure 11, this shows another side view, but wherein the upper end 82 of the shaft 74 is arcuate in shape, either because the shape has been configured into the water deflector 70 in the manufacturing process, or because it has been bent over so that the generally vertical shaft 74 in Figure 10 assumes the arcuate shape.

[067] With respect to the arcuate upper end 82, in one preferred embodiment, the water deflector 70 is comprised of a malleable material, such as a metal, which can be deflected or bent into a position within a nozzle 40 so as to interrupt a portion of the stream of water passing therethrough and thereby provide optimal coverage of the area watered by the nozzle.

[068] Figure 12 of the drawings shows a top view of the water deflector 70 illustrated in Figure 9 of the drawings. It will be noted that shaft 74 extends upwardly, and the flanges 78 and 80 position the deflector 70 within the water channel 50. In Figure

12, the water channel 50 is shown in phantom lines, to show the relative position of the water deflector 70 therein. From this figure, it will be seen that the flanges 78 and 80 act against the side walls of the channel 50 so that the shaft 74 preferably tends to be near, although not directly adjacent, the wall of the channel 50. This preferred positioning of the deflector 70 within the channel 50 provides a main water stream area 86, in front of the shaft 74 and between the flanges 78 and 80, and a secondary water stream area 88 behind the shaft 74. Thus, water is able to flow on both sides of the shaft, a feature which itself enhances the consistent dispersal of water over the area to be covered.

[069] With reference to Figure 13, a top view of a water deflector 90, in accordance with another embodiment of the invention, is shown. In this embodiment, the shaft 92 extends upwardly, and semi-circular flanges 94 and 96 are located at each side edge of the shaft 92, and in this embodiment, positions the shaft 92 somewhat centrally within the channel 50. This structure of water deflector 90 may be particularly suitable when the water deflector is constructed of a plastics material, from a plastic mold. In Figure 13, two substantially equivalent water stream areas 98 and 100 are provided which flow over the shaft, deflecting the water for optimal dispersal. Figure 15 of the drawings shows a side view of the water deflector 90 shown in Figure 13 of the drawings, and the arrows in this drawing show the water streams 98 and 100 on

each side of the shaft 92. The shaft 92 is arcuate at its upper end, which is located in the mouth or outlet of a nozzle 40. When constructed of plastic the water deflector 90 shown in Figure 15 may, under the pressure of the water, reciprocate or oscillate rapidly in an up-and-down motion, as indicated by arrow 102. This up-and-down reciprocation alternately directs the water somewhat higher and somewhat lower, the overall effect of which is to provide optimal and consistent dispersal rates of the water in the area to be covered.

[070] With reference to Figure 14, there is shown molded or manufactured water deflectors 108 on a base piece 110. The water defectors 108 have a point of weakness 112 near their connection with the base part 110, so that they can be easily snapped off. This arrangement allows for the convenient sale and storage of a plurality of water defectors, which may be of the same or different shapes and configurations, so that the user can simply snap one off the base 110 when required.

[071] Figures 16 to 21 show various embodiments of the water deflector of the invention, including different features and shapes which may be of particular importance when providing for a specific application.

[072] Figure 16 of the drawings shows a single concept water

deflector 114 including a shaft 116, a base 118, and flanges 120 and 122. An aperture 124 is provided in the shaft 116. It will be noted that in the embodiment shown in Figure 16 the shaft 116 is bent in dog-leg fashion at bend 126 so that the outer portion 128 is positioned at an angle compared to the inner portion 130. The slot or aperture 124 extends approximately equidistantly from the bend point 126. The flanges 120 and 122 position the water deflector 114 appropriately within the channel 50, and the base 118 prevents the water deflector 114 from being forced out of the channel 50 due to the pressure of the water.

[073] Figure 17(a) shows a water deflector 136 including a shaft 138 and base 140. The shaft 138 includes a slot 142. The uppermost tip 144 of the shaft 138 is bent over at approximately right angles to the remainder of the shaft 138, to provide a variation in the watering pattern. This configuration is designed for a model where the nozzle fits snugly within the head and no projections from the head can be accommodated. Thus, the deflector should be contained wholly within the nozzle so that it does not impede the nozzle/head retraction mechanism when the sprinkler is not in use. Figures 17(b) and (c) illustrate the preferred type of retractable nozzle and head assembly, with the deflector 136 inserted into the assembly in Figure 17(c) of the drawings.

[074] Figure 18(a) shows a water deflector 148 having a base

150 and multiple shafts 152 and 154. Each shaft 152 and 154 has an aperture 156 and 158 respectively which substantially overlap with each other. Flanges 160 are provided for proper positioning of the water deflector 158 within a channel. In Figure 18(b), there is a schematic representation of the effect produced by the water deflector 148 shown in Figure 18(a), which provides full and consistent coverage of the area to be watered.

[075] Yet another embodiment of the water deflector is shown in Figure 19. In this Figure, water deflector 164 comprises a base 166, shaft 168 and flanges 170, as previously described. The shaft 168 includes the usual slot or aperture 172. The end 174 of the shaft 168 has a forked configuration, which itself influences the nature of the interruption of the water stream, and hence the nature of the dispersal of the water in the area covered. The forked end 174 generally has the effect of directing less water spray to the ground near the nozzle.

[076] In Figure 20, there is shown a water deflector 176, in this case having a flared end 178, wherein the shaft 180 has a narrow or tapered portion 182, and a flared or bulbous end 178. Once more, this particular shape affects the nature of the water dispersal, in this case directing a wider spray to the area near the head.

[077] With respect to Figure 21 of the drawings, a water deflector 186 includes a shaft 188 having a slot 190 such that the slot 190 is open at the end 192 of the shaft. The split end water deflector 186 allows each elongate component 194 and 196 to be independently bent with respect to each other, and thus provides the user with some flexibility for adjustment in order to achieve an optimum pattern of watering in a given condition. Although one split is shown in Figure 21 of the drawings, a water deflector may have more than one split, producing several arm components, each of which can be independently adjusted according to the nature of the area to be watered.

[078] Figures 22(a) and (b) show a deflector 180 having a pair of arms 182 and 184. A deflector plate 186 is formed between the two arms 182 and 184. In use, the deflector 180 is slid onto a nozzle 188 in the manner illustrated in Figure 23. The plate 186 is located in or about the mouth 190 to deflect the stream, as discussed above. This arrangement can also be seen in Figure 24 of the drawings which shows a top view of the nozzle 188 and the appropriately located plate 186. When attached, the arms 182 and 184 locate outside the nozzle's lower section 46 and are held in place when the nozzle 40 is screwed into an appropriate head (not shown).

[079] Figure 25 shows a deflector 192 having a shaft which is

attached, substantially permanently, in the water channel 194 of nozzle 196. Although the deflector 192 is shown as being attached within the channel 194, it can also be attached elsewhere on the nozzle, such as in the mouth area 198.

[080] Reference is now made to Figures 26 and 27 of the drawings, which schematically show a nozzle with incorporated deflector mechanisms. The nozzle 210 comprises a body 212 including a water channel 214 and a hole 216 for accommodating a screw to adjust the volume of the water exiting the nozzle 210. A cap 218 is affixed to the top end 220 of the body 212.

[081] The water channel feeds into an upper outlet channel 222, a middle outlet channel 224 and a lower outlet channel 226. As will be noted from Figure 26 of the drawings, the upper outlet channel 222 slopes upwardly, and the water spray emanating therefrom will cover an area which is further away from the nozzle 210. The middle outlet channel 224 is generally horizontal, and the water spray discharged therefrom will have sufficient thrust or power so as to irrigate an area which is at an intermediate distance from the nozzle 210. Finally, the lower outlet channel 226 is sloped downwardly and will thus, for the most part, irrigate an area which is closer to the nozzle than either of the outlet channels 222 and 224. The channels, in various embodiments, may be aligned along a vertical plane or may be offset from each other along a vertical

plane.

[082] Figure 27 shows a front view of the nozzle shown in Figure 26 of the drawings, with the upper, middle and lower outlet channels 222, 224, and 226 respectively. It will be seen from this front view that each of these channels is of different size. The smallest outlet is the one from the lower outlet channel 226, while the largest is from the upper outlet channel 222. An intermediate size outlet is provided for the middle outlet channel 224. As such, more water will exit through the upper outlet channel 222 than either of the middle or lower outlet channels 224 or 226 respectively. Of course, this is in keeping with the function of the upper outlet channel 222, to irrigate an area further from the nozzle 210. This of course will be a larger surface area to irrigate than either of the middle or lower outlet channels 224 or 226, hence the need for a large volume of water to exit this channel. By the same token, the middle outlet channel 224 needs to be larger than the lower outlet channel 226, since it will cover a larger surface area with spray. Experimentation has shown such dimensioning of the channels provides an even distribution of water being cast over the area intended by the nozzle.

[083] A tab or deflector may be associated with some or all of the outlet channels 222, 224 and 226 to direct water from the water channel 214 within the nozzle 210 and to facilitate proper volume

distribution through each of the outlet channels 222, 224 and 226. In this regard, a deflector 230 is positioned in the water channel 214 above middle outlet channel 224 and a deflector 232 is positioned in the water channel 214 above lower outlet channel 224. These deflectors 230 and 232 serve to intercept and direct a sufficient amount water to exit the middle and lower outlet channels 224 and 226 respectively, which may otherwise be at least partially by-passed by much of the water. In this way, volume distribution appropriate to meet the watering and spread requirements can be achieved. The deflectors 230 and 232 may be variable in terms of shape and dimension to achieve this purpose. For example, Figure 26 shows alternative or additional deflectors 234 and 236 of different shape which can be used. Normally the upper outlet channel 222 would not require a deflector to deflect water into it, although a deflector or projection could still be used. Further, a deflector associated with the upper outlet channel 222 may in fact limit the amount of water entering the upper outlet channel 222 from the water channel 214, having the effect of increasing water volume distribution to the middle and/or lower outlet channels 224 and 226.

[084] The combination of the three channels 222, 224 and 226 provide a nozzle 210 which has a wide ranging area of irrigation, the irrigation being accomplished in a substantially consistent spray over the entire area without any one area receiving more or

less of the water spray.

[085] In another embodiment shown in Figures 29(a) and (b) of the drawings, channels 280, 282, 284 and 286 may be formed by metal (or another material) flat strips 288, 290 and 292 which are suitably oriented in an opening 294 so that water discharged from the nozzle will be dispersed upwardly, downwardly or substantially horizontally, depending upon the location of exit and the angle of the particular strips 288, 290 and 292 through which the water passes.

[086] Reference is made to Figure 28 of the drawings showing another embodiment of the invention. In this embodiment, there is shown a nozzle 250 having a body 252 defining a chamber 254 which can be connected to a source of water, not shown. The body 252 has side wall 256 and a top wall 258 with a screw therein for adjusting the volume of water passing through the chamber 254. The side wall 256 comprises a plurality of faces 260, 262 each having a elongate aperture 264 and 266 therein. The nozzle 250 shown in Figure 28 has four flat faces in all, although the invention may provide nozzles which have any desired number of faces, which may be flat, curved or otherwise shaped.

[087] A deflector insert 270 is sealingly located in each aperture 264, 266. The deflector insert 270 is a rectangular,

substantially flat plate member having at least one, but preferably a plurality, of horizontal slots 272 through which water exits from the nozzle 250. The deflector insert 270 shown in Figure 28 has four slots 272 arranged one above the other. Other configurations in the arrangement of the slots may be provided. Further, the slots 272 may each be of a different size and shape, for example having the effect seen in Figure 27 of the drawings so that predetermined amounts of water will exit each slot 272.

[088] The deflector insert 270 may have tabs 274 to intercept and direct water through the apertures and slot. The deflector insert 270 is installed by the manufacturer in different forms as may be suited to a user. Different apertures 264, 266 etc. may have different deflector inserts 270, and some deflector inserts 270 may be solid, i.e without slots, if an area is not to be watered. This is equivalent to conventional one quarter, one half, three quarter etc. watering nozzle heads.

[089] While many different embodiments of particular water deflectors have been shown and described above, it will be appreciated that the invention is not intended to be limited to any one or only those described herein. Rather, the variety of examples is intended only to exemplify the wide range in flexibility provided by a water deflector which can be used with a nozzle in order to achieve the best water coverage for a particular area to

be watered.

[090] It should also be appreciated that a nozzle 40 may have, as part of the manufacturing process, affixed thereto a water deflector of the invention, so that the invention comprises the composite of the nozzle as well as the deflector as a unitary product. However, the invention also relates only to the water deflector itself, which may come in many different embodiments, and which can be manually or automatically inserted and removed, as appropriate, from nozzles which have not been fitted with such water deflectors.

[091] In operation, the water deflector, when standing alone, can be easily inserted within a nozzle 40. The nozzle 40 is disconnected from the irrigation system, usually by unscrewing it from the main piping, or offshoot piping for that nozzle. The water deflector is then pushed through the inlet 60, and into the channel 50 of the nozzle. The end thereof may then either project out through the mouth 52 or reside within the nozzle depending upon the configuration of the nozzle and/or head. This is well illustrated in Figure 8 of the drawings. The flanges are constructed so as to keep the water deflector appropriately located, for the best dispersal of water, within the channel 50. The water deflector cannot be pushed out through the channel by virtue of the water pressure since the base on the water deflector, such as 72 in

Figure 9 of the drawings, acts on and is stopped by the underside of the bottom section 46 of the sprinkler nozzle 40. With the water deflector located in the channel 50 and mouth 52, the end of the deflector can be adjusted by bending it up or down respectively to achieve the best watering configuration.

[092] Water runs up through the channel on both sides of the shaft, and the water deflector ensures that some of the water, at least, goes to areas nearer the sprinkler head, which may have been previously unwatered. The elongate hole or slot, common to all of the water deflectors in a preferred embodiment thereof, ensures that the water pressures and transfer across and through the water deflector takes place, and facilitates consistency of watering.

[093] The invention therefore provides an effective device for directing a portion of the water that issues from a sprinkler nozzle to an area near the head, while allowing the remaining portion of water to be dispersed to more distant areas. The flanges are effective not only in properly seating the shaft appropriately within the channel, but also stabilize the water deflector within the channel so as to prevent rotation thereof under the pressure of the water stream. While the water deflector is to some extent bendable, it will not, under normal circumstances, change shape in response to the pressure of water flowing over and through it. Further, the base ensures that the water deflector stays fixed and

does not pass through the channel. The base may extend out linearly in a straight line, or may be circular or semi-circular. The shape is not of particular importance in most cases, as long as it is wider than the channel so as to prevent discharge of the water deflector under pressure.

[094] Generally, the location of the slot within the shaft allows water to pass therethrough. In most embodiments, the slot does not extend to the end of the shaft, and the end piece thereof is generally important in diverting a portion of the water to direct it downwards and nearer the area at the base of the sprinkler head, which might otherwise have gone unwatered.

[095] The water deflector may be constructed of any suitable material, including metals such as non-ferrous metals, plastic, composite material or other durable rust resistant materials.

[096] The length of the shaft itself may be variable, so that either less or more of such length extends outwardly through the mouth 52 of the nozzle 40. By varying the length of the shaft, a particular water deflector can be tailored so as to produce the optimal watering consistency desired by the user.

[097] The invention is not limited to the precise details described above and may vary in accordance with the general

description and the following claims.